submitted on November 9, 2001. Accordingly, submitted herewith are copies of all cited prior art documents along with a new Information Disclosure Statement and the required fee set forth in 37 CFR 1.17(p). Consideration of the Information Disclosure Statement is respectfully requested.

In response to the informalities noted by the Examiner with regard to the title and the disclosure, applicants have amended the title as suggested. In addition, the bracketed title as shown on pages 1 and 16 has been deleted.

In the first Office Action, claims 1-13 have been rejected under 35 U.S.C. 112, second paragraph, as being indefinite. Specifically, the Examiner asserts that it is unclear what "thin-walled" means. However, the Examiner is referred to the specification at page 4, lines 1-3, which clearly define a "thin-walled" article as one which has a wall thickness of less than about 2 mm, and preferably less than about 0.5 mm. It is submitted that the claims, when read in light of the specification, are clear and in compliance with 35 U.S.C. 112, second paragraph.

With regard to the recitation of "metal precursor powder" in line 1 of claim 13, applicants have now amended that claim to recite "metal powder". Proper antecedent basis for this recitation may be found in claim 1.

Claims 1 and 2 have been rejected under 35 U.S.C. 102(b) as being anticipated by Barnard et al. (U.S. 5,574,957). Barnard et al. teach a method for encasing a ceramic or metal object or structure by co-extruding an encasement around the structure. The batch materials taught by Barnard et al. include a ceramic or metal powder, a binder, and a volatile component selected from water, organic solvents, or a wax. The Examiner asserts that Barnard et al. teach a process which includes mixing zirconia, zirconium or yttria with a styrene/butadiene copolymer binder and a solvent (col. 9, line 36), extruding, and sintering. However, applicants wish to point out that Barnard et al. teach the use of two types of binders, one based on water-soluble binders, and the other based on thermoplastic polymers. See col. 6, lines 42-48.

Applicants note that a solvent is included only in embodiments where a **water-based** binder system is used. In such an embodiment, the binder is a cellulose ether, such as methyl cellulose, used either alone or in combination with a co-binder of polyvinyl alcohol, and the solvent comprises water. See col. 9, lines 33-36. In embodiments where a thermoplastic polymer is used as the binder, the binder system includes a low-melting wax, not an organic solvent as claimed. See col. 7, lines 9-12. While the low-melting wax of Barnard et al. may function as a solvent, it must be heated in order to melt and dissolve the polymeric binder as the waxes disclosed in Barnard et al. are **crystalline solids** at room temperature with a melting point not exceeding about 80°C. See col. 6, lines 60-67. This is in contrast to the teaching of the present invention which utilizes organic solvents which are in **liquid form** at room temperature. See the list of organic solvents in the last paragraph of page 4 of and claim 1 as amended.

As taught in the present invention, the method of the present invention provides an improvement over prior art methods such as Barnard et al. because the use of an organic solvent allows the preparation of the binder system without the use of high temperatures to achieve mixing as well as removal of the solvent by evaporation at low temperatures. See the specification at page 5, lines 9-13. Barnard et al. clearly do not teach or suggest combining a thermoplastic polymeric binder with a liquid organic solvent, which solvent is then evaporated from the mixture as claimed. Accordingly, claim 1, as amended, and claim 2, which depends therefrom, are clearly patentable over Barnard et al.

Claims 1-13 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Theodore et al. (U.S. 4,615,851) in view of Barnard et al. and JP 04327216A (abstract). Theodore et al. teach a method of making thin-walled electrolyte tubes in which a thermoplastic binder is mixed with ceramic powder using heated mill rolls. The Examiner has taken the position that the processing aids (esters of fatty acids) disclosed by Theodore are solvents for its binders, referring to col. 6, lines 45+.

However, there is no teaching or suggestion in Theodore that the disclosed processing aids function as a solvent for the polymeric binder. Rather, Theodore teach that the processing aids are used to act as an anti-stick agent during calendering and extruding, or are useful in dispersing the ceramic particulate. See col. 6, lines 47-52.

Further, Theodore et al. require the use of heat to achieve mixing of the binder composition. See col. 9, lines 56-63. This teaching is in contrast with the present invention, which does not require the use of high temperatures to achieve mixing. Nor do Theodore et al. teach or suggest evaporation of a solvent from the binder system mixture as claimed.

The Japanese abstract cited by the Examiner (JP 04327216A) teaches the preparation of a ceramic wire rod for use as a reinforcing material which includes supplying a mixture of powdered ceramics and dispersing agent to a small diameter nozzle, applying a thermosetting resin to a large diameter nozzle surrounding the small nozzle, drawings strips from the nozzles, and then sintering.

The Examiner has taken the position that it would have been obvious for one skilled in the art to employ the yttria sintering aid and "organic media" of the Japanese abstract along with the plasticizer of Barnard in the composition of Theodore to obtain the claimed method. Applicants strongly disagree.

The Examiner is first referred to the additional abstract obtained by applicants from Chem. Abstracts (copy enclosed) as well as the enclosed translation of paragraph 11 of the reference. As can be seen from the abstract and translation, the Japanese reference teaches the preferred use of liquid **thermosetting** resins which are dispersed into solvents, not **thermoplastic** polymeric binders as claimed. While the Japanese reference teaches that it is possible to use thermoplastic resins, such use is at "a **high temperature** melt condition." There is no teaching or suggestion in the Japanese reference that thermoplastic resins, when used, are provided in a substantially homogeneous solution of an organic solvent as claimed. And, as previously pointed

out, the use of an organic solvent as claimed allows the binder system to be mixed **without** the use of heat, and heat is clearly required with the use of thermoplastic resins in the Japanese reference.

Accordingly, even if the teachings of the references were combined as proposed by the Examiner, the claimed method would not result as none of the references teach the use of a polymeric binder system comprising a substantially homogeneous solution of a thermoplastic polymeric binder and an organic solvent which is in liquid form at room temperature as recited in claim 1. Claim 1, and claims 2-13 which depend therefrom, are clearly patentable over the cited references.

For all of the above reasons, applicants submit that claims 1-13, as amended, are patentable over the cited references. Early notification of allowable subject matter is respectfully requested.

Respectfully submitted,

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APPENDIX
VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE SPECIFICATION

Title at page 1:

[[POLYMERIC BINDER SYSTEM AND METHOD OF MAKING SAME, METHOD OF PREPARING THIN-WALLED ARTICLES BY EXTRUSION, AND THIN-WALLED ARTICLES PRODUCED THEREBY]]

METHOD OF PREPARING THIN-WALLED ARTICLES

Page 16, lines 1-14:

[[POLYMERIC BINDER SYSTEM AND METHOD OF MAKING SAME, METHOD OF PREPARING THIN-WALLED ARTICLES BY EXTRUSION, AND THIN-WALLED ARTICLES PRODUCED THEREBY]]

ABSTRACT OF DISCLOSURE

A polymeric binder system and method of making, and a method for extruding thin-walled articles such as thin-walled tubes is provided. The extrusion method comprises providing a polymeric binder system comprising a substantially homogeneous solution of a polymeric binder and an organic solvent, adding a ceramic or metal powder to form a mixture, and evaporating the solvent from the mixture. The remaining mixture is then extruded from a die and heated to burn-off the binder and sinter the article.

IN THE CLAIMS

1.(Amended) A method of forming an extruded thin-walled article comprising:

providing a polymeric binder system comprising a substantially homogeneous solution of a thermoplastic polymeric binder and an organic solvent which is in liquid form at room temperature;

adding a ceramic or metal powder to said polymeric binder system to form a mixture;

evaporating said organic solvent from said mixture; and

extruding the remaining mixture from a die to form a thin-walled green article.

13.(Amended) The method of claim 1 wherein said metal [precursor] powder comprises nickel oxide plus yttria-stabilized zirconia.